ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

FINAL
Surface Water Remedial Action Objectives Technical Memorandum

Rocky Flats Environmental Technology Site
10808 Highway 93
Golden, CO 80403-8200

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1/27

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FIGURES

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ACRONYMS

AL	Action Level
ALF	Action Levels Framework
AoI	Analytes of Interest
AME	Actinide Migration Evaluation
CAD	Corrective Action Decision
CDPHE	Colorado Department of Public Health and Environment
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CHWA	Colorado Hazardous Waste Act
COC	Contaminant of Concern
DOE	U S Department of Energy
EPA	Environmental Protection Agency
FS	Feasibility Study
IHSS	Individual Hazardous Substance Site
MCL	Maximum Contaminant Level
IMP	Integrated Monitoring Plan
NESHAP	National Emission Standards for Hazardous Air Pollutants
POC	Point of Compliance
POE	Point of Evaluation
PPRG	Programmatic Preliminary Remediation Goal
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RFCA	Rocky Flats Cleanup Agreement
RFETS	Rocky Flats Environmental Technology Site
RI	Remedial Investigation
ROD	Record of Decision
SID	South Interceptor Ditch
SWWB	Site-Wide Water Balance
TM	Technical Memorandum
WQCC	Water Quality Control Commission

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1 0 INTRODUCTION

This Technical Memorandum (TM) presents the proposed surface water remedial action objectives (RAOs) for final cleanup of the Rocky Flats Environmental Technology Site (RFETS, Rocky Flats, or Site) The TM has been prepared pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Remedial Investigation/Feasibility Study (RI/FS) Report Work Plan (DOE 2001), and the Rocky Flats Cleanup Agreement (RFCA) Pursuant to the Work Plan, other TMs will be prepared that identify RAOs for surface soil as well as for subsurface soil and groundwater Because transport of contamination occurs between environmental media, the RAOs for each medium are interdependent and are developed with this understanding

Under CERCLA, RAOs specify the contaminants and media of concern, potential exposure pathways, and remediation goals to be considered for the final response action Remediation goals establish acceptable exposure levels that are protective of human health and the environment The RAOs are established for the purpose of developing and screening alternatives in the FS The FS provides an analysis of how feasible it is for alternative remedial actions to meet these RAOs in relation to the nine CERCLA criteria for final remedy selection Final remediation goals to be addressed and accomplished by the final remedy are proposed in the Proposed Plan for the final remedy based upon the information developed in the RI/FS, and are incorporated into the Corrective Action Decision/Record of Decision (CAD/ROD) for the selected remedy

Although the RAOs could be proposed during preparation of the FS, it is important to develop and formally document the RAOs at this time so that the RAOs are considered in the planning and execution of accelerated actions pursuant to RFCA The TMs provide this mechanism Accordingly, the TMs can also be used to provide the technical basis for conforming changes to RFCA, specifically to RFCA Attachment 5, "Action Levels and Standards Framework for Surface Water, Ground Water, and Soils" (ALF)

Upon approval of this TM by the Environmental Protection Agency (EPA) and the Colorado Department of Public Health and Environment (CDPHE), the RAOs for surface water will be incorporated into the draft RI/FS Report, and ultimately considered in developing final RAOs in the Proposed Plan for incorporation into the final CAD/ROD This TM will also serve as the basis for proposing conforming modifications to (ALF), as appropriate

2 0 OBJECTIVES

This TM provides the proposed RAOs for surface water Specifically, the TM identifies the Contaminants of Concern (COCs), the water quality standards to be attained, and the methodology for demonstrating compliance with the standards, including identification of Points of Compliance (POCs) These RAOs are consistent with the CERCLA requirements First, these RAOs specify the COCs Second, the surface water standards are based on human and ecological exposure pathways, e g , the standards consider direct human ingestion of surface water as a drinking water source, and exposure of aquatic life to the contaminants Also, the surface water standards by definition establish acceptable exposure levels that are protective of human health and ecological resources The methodology for demonstrating compliance with the standards at POCs is provided as a RAO in order to provide the means to address the spatial and temporal variability of the contaminants in this environmental medium

Since preparation of the FS will coincide with the expected close out of all accelerated actions, information gathered during conduct of the accelerated actions will be used to evaluate whether these proposed RAOs continue to provide adequate protection of human health and the environment Such information would include new data/findings arising from the Actinide Migration Evaluation (AME) study, the Site-Wide Water Balance (SWWB) study, ecological studies, and surface water monitoring activities and site

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characterizations If it is determined that the RAOs should be modified before the completion of the FS, the modification will be noted in the FS or by a revision to the TM

This TM does not address post-closure surface water management or the final configuration of the retention ponds at closure As discussed herein, the TM predicates that the on-Site terminal ponds will be retained at closure because of wide community acceptance However, this assumption does not imply that retention of the terminal ponds would actually be required as part of the final CERCLA remedy for the Site It also does not preclude an evaluation of alternative pond configurations, including the removal of all ponds Such an evaluation will be conducted, and if removal of the terminal ponds is determined to be appropriate by DOE, or otherwise required after consultation with the regulatory agencies and the stakeholders, then the TM will be modified or the FS will note the change in the assumption

3 0 BACKGROUND

3 1 Rocky Flats Cleanup Agreement

RFCA adopted an accelerated action approach to Site cleanup, as described in RFCA paragraph 79

> To expedite remedial work and maximize early risk reduction at the Site, the Parties intend to make extensive use of accelerated actions to remove, stabilize, and/or contain Individual Hazardous Substance Sites (IHSSs)

In order to provide guidance on the need for, or extent of, accelerated actions, action levels for ground water and soils, and action levels and standards for surface water are established by RFCA and are contained in ALF These action levels, when exceeded, trigger an evaluation, accelerated action, and/or management action Pursuant to RFCA paragraph 75

> "The [ALF] surface water standards are in-stream contaminant levels that, the regulators will require DOE to meet for activities undertaken prior to the final CAD/ROD, and which constitute the Parties current joint recommendation for the CAD/ROD "

Surface water standards in ALF are based on Colorado surface water use classifications assigned to Segment 4a/4b and 5 of Big Dry Creek, i e , water supply, aquatic life – warm II, recreation II, and agriculture These surface water use classifications are consistent with the uses described in the RFCA preamble, although the water onsite and offsite in Big Dry Creek is not currently used for water supply prior to mixing with significant water volumes from other tributaries

3 2 Existing Surface Water Management

3 2 1 Drainages

Surface water flows from the Site via ephemeral streams that pass through or are adjacent to the Site (Figure 1) Three of these streams, North Walnut Creek, South Walnut Creek, and Woman Creek, contain detention ponds that are currently used to manage surface water Surface water originates from runoff and groundwater discharge, and in the case of South Walnut Creek, also from discharge of treated water from the Site Wastewater Treatment Plant As shown in Figure 2, the creeks and ponds are part of Segments 4a/4b and 5 of Big Dry Creek as follows

Segment 4a – Mainstem and all tributaries to Woman Creek and Walnut Creeks from the sources to Standley Lake and Great Western Reservoir, except for specific listings in Segments 4b and 5,

Segment 4b – North and South Walnut Creek and Walnut Creek, from the outlet of Pond A-4 and B-5 to Indiana Street,

Segment 5 – Mainstems of North and South Walnut Creek, including all tributaries, lakes, and reservoirs, from their sources to the outlets of Ponds A-4 and B-5, on Walnut Creek, and Pond C-2 on Woman Creek

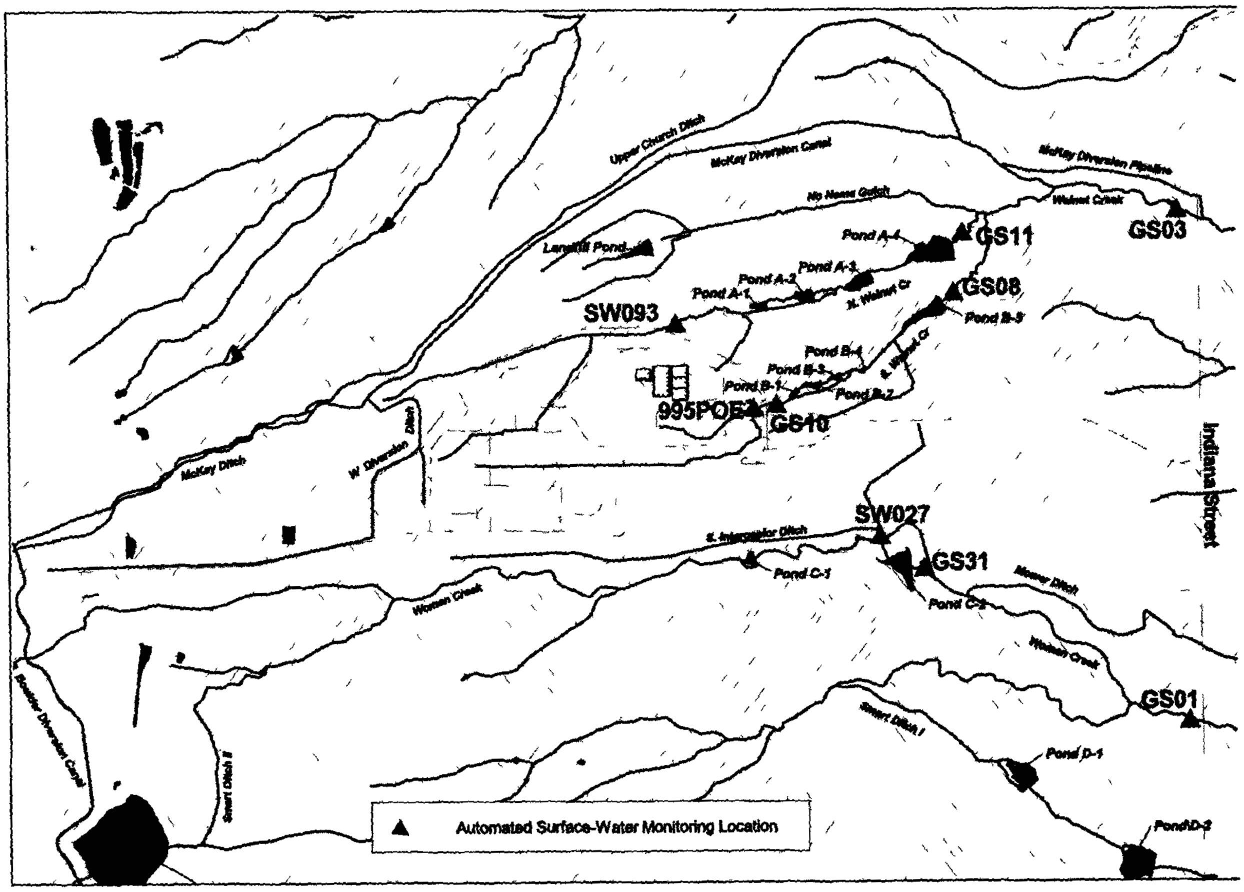

Figure 1 Surface Water Monitoring Stations at RFETS

3 2 2 Ponds and Controls

There are a number of ponds and controls in place at Rocky Flats, whose general purpose is to control and divert flows, and provide safeguards to the movement of contamination Site personnel manage the on-site ponds in the Woman Creek and Walnut Creek drainages Water management consists of monitoring pond levels, measuring water quality, and releasing water through valves or other diversions Currently, the terminal ponds (namely, A-4, B-5, and C-2) are operated in a "batch and release" mode That is, water samples are collected from the ponds while they are filling, and analytical results for the samples are reviewed prior to release of the water Site personnel do not generally release water before the analytical results are reviewed, but occasionally the ponds fill at rates greater than expected, and dam safety concerns dictate that the water be released prior to obtaining the analytical results

3 2 2 1 A-Series Ponds

The A-series ponds consist of a system of four dams in the North Walnut Creek drainage The A-series terminal pond, Pond A-4 is the largest detention pond at Rocky Flats The A-series ponds receive base flow from North Walnut Creek, as well as runoff from the northern portion of the industrial area Also, water from the Landfill Pond on No Name Gulch is pumped to these ponds Typically the water is pumped through the A-1 bypass into Pond A-3, however, the water is occasionally pumped directly into Pond A-1 to keep the sediments wet Water is not discharged from Ponds A-1 or A-2 All other water in the North Walnut Creek drainage flows to Pond A-4, the terminal pond

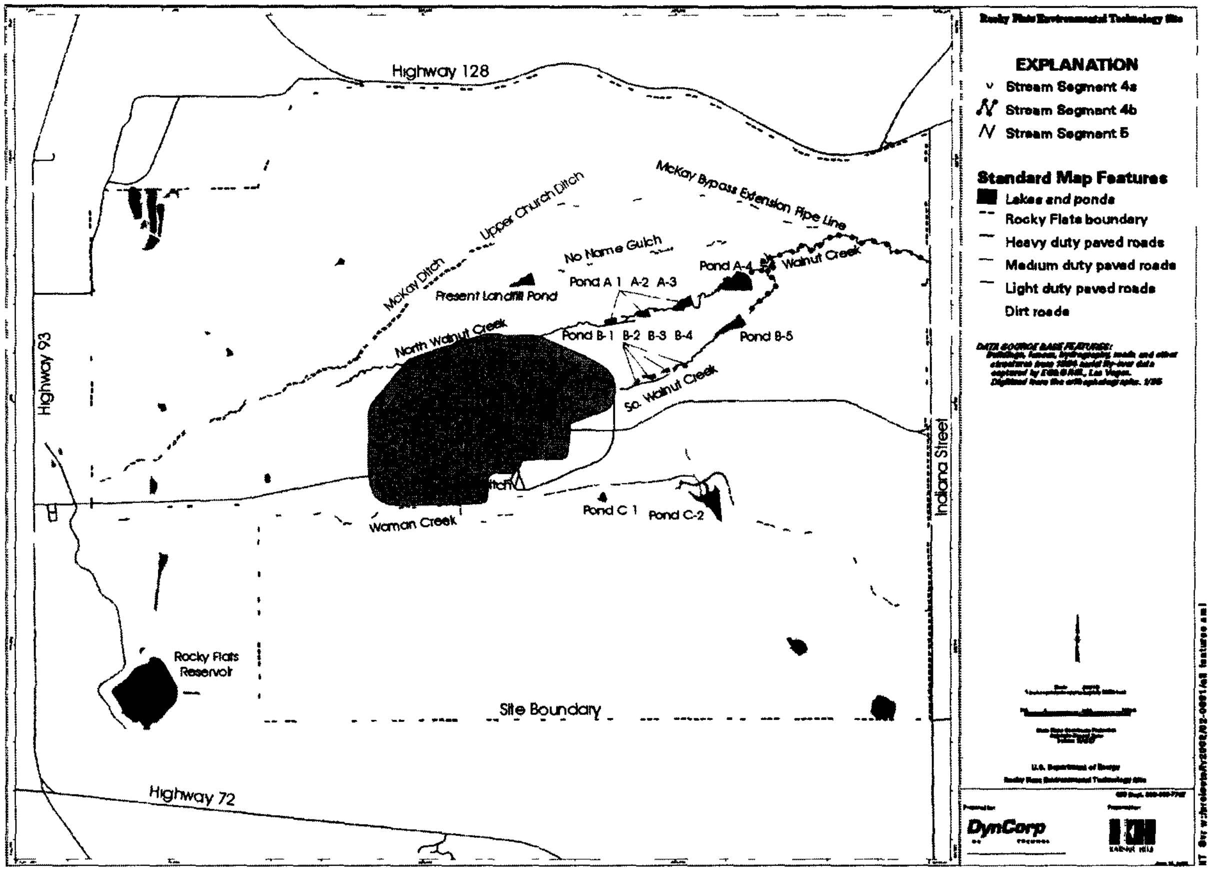

Figure 2 Segments 4a, 4b, and 5 of Big Dry Creek

3 2 2 2 B-Series Ponds

The B-series ponds consist of a system of five dams in the South Walnut Creek drainage This drainage receives flows from the central industrial area, much of it through the Central Avenue Ditch, as well as discharges of treated water from the Site's Wastewater Treatment Plant, which enters Pond B-3 All water in the South Walnut Creek drainage flows to Pond B-5, the terminal pond and largest of the B-series ponds Ponds B-1 and B-2 are isolated from the rest of the drainage, except during emergency events when contaminants from accidental releases upstream might be routed to these ponds

3 2 2 3 C-Series Ponds

The C-series ponds consist of two dammed structures in the Woman Creek drainage Pond C-1 is a structure in Woman Creek that is unmanaged because it is isolated from potentially contaminated runoff arising from the Site Industrial Area Pond C-2 is an off-channel structure in the Woman Creek drainage that receives flows from the southern portion of the Industrial Area via the South Interceptor Ditch (SID) While the A- and B-series terminal ponds are discharged frequently throughout the year, Pond C-2 receives much less inflow, and in drier years may not be discharged

3 2 3 Additional Downstream Surface Water Quality Protection

Several actions have been taken to offer further protection of downstream surface water quality These actions were the construction of the McKay Bypass Pipeline and Broomfield Diversion Ditch, and the Option B diversion project

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3 2 3 1 McKay Bypass Pipeline and Broomfield Diversion Ditch

The natural discharge point for Walnut Creek is into the Great Western Reservoir approximately 0 5 miles downstream of Indiana Street, a former water supply reservoir for the City of Broomfield However, in 1989, the City of Broomfield constructed the Broomfield Diversion Ditch so that the RFETS portion of the Walnut Creek drainage basin could be diverted around Great Western Reservoir The Broomfield Diversion Ditch is under the control of the City of Broomfield, and starts just downstream of Indiana Street

As shown in Figure 1, No Name Gulch, North Walnut Creek, and South Walnut Creek combine to form Walnut Creek about 4,000 feet west of Indiana Street Historically, the McKay Diversion Canal, which is water supply conveyance under the control of the City of Broomfield, routed surface water around RFETS with discharge into Walnut Creek just downstream of these tributaries In 1999, DOE funded construction of the McKay Bypass Pipeline to allow direct discharge of this water into Great Western Reservoir

3 2 3 2 Option B Diversion Project

In the early 1990s, the Option B diversion project was requested by the local communities to isolate their water supplies from Site surface water discharges The project was largely funded by DOE, and the total cost of the project exceeded $100 million The project had two major components, both of which have been implemented The first component, which began interim operations in January 1996, was the the Woman Creek Reservoir, a 100-year flood detention basin on Woman Creek to isolate water in Standley Lake from Site surface water discharges All Woman Creek flow enters the basin and is pumped to Walnut Creek just east of Great Western Reservoir The second component was the abandonment by the City of Broomfield of Great Western Reservoir as a water supply, with the procurement of a replacement water supply The replacement water is western slope, Windy Gap water, which Broomfield purchased with DOE funding The project included the construction of a water supply pipeline from Carter Lake, the eastern slope storage reservoir for this water, as well as a new drinking water treatment plant The opening ceremony for the water treatment plant was held in July 1997, and Broomfield abandoned use of Great Western Reservoir as a drinking water source in September of that same year

As a result of the construction of the Option B project, water flowing offsite is not utilized for a drinking water supply by the neighboring downstream cities Discharges offsite are diverted via Walnut Creek to Big Dry Creek where they are mixed with much larger volumes of wastewater discharges from the Cities of Broomfield and Westminster, along with non-point discharges Big Dry Creek discharges into the South Platte River in the vicinity of Fort Lupton Downstream of this confluence the surface water becomes a source for drinking water

4 0 SURFACE WATER REMEDIAL ACTION OBJECTIVES

This TM identifies the Points of Compliance (POCs), the Contaminants of Concern (COCs), and the methodology for demonstrating compliance with surface water standards POCs are the locations where compliance monitoring will be conducted, COCs are the constituents to be monitored, and the methodology for demonstrating compliance is the data assessment to be used to determine if COCs meet the respective surface water standard

4 1 Points of Compliance

In accordance with ALF (Section 2 3)

> "[Points of Compliance] POCs will be at the outfalls of the terminal ponds and near where Indiana Street crosses both Walnut and Woman Creeks If the terminal ponds are removed, new

monitoring and compliance points will be designated and will consider ground water in stream alluvium"

ALF establishes POCs for Segment 5 at the outfalls of terminal ponds A-4, B-5, and C-2 (stations GS11, GS08, and GS31), and for Segment 4a/4b at the two locations where Walnut and Woman Creek cross Indiana Street (stations GS03 and GS01)

4 1 1 Segment 5 POCs

Per ALF, if the terminal ponds are removed or no longer used as control structures, then new POCs will be designated If the terminal ponds exist at closure, their outfalls are logical POCs because they are the last management controls in place for surface water This TM is based upon DOE's assumption that terminal ponds upstream of the current POCs at the outfalls will remain during active remediation and after closure It is also assumed that the SID will remain after closure because the SID is an integral part of the Pond C-2 surface water management system Thus, the outfalls of the terminal ponds, stations GS11, GS08, and GS31, are proposed as the Segment 5 POC's at closure

4 1 2 Segment 4a/4b POCs

The current (ALF) POCs (stations GS-01 and GS-03) are proposed as the Segment 4a/4b POCs at closure

4 2 Contaminants of Concern

The proposed COCs at closure are a slight modification to the Integrated Monitoring Plan (IMP)[1] Analytes of Interest (AoIs) that are currently monitored at the Segment 5 and 4a/4b POCs The AoIs for the Segment 5 POCs (Walnut and Woman Creek terminal pond discharges) are plutonium, americium, uranium, pH, conductivity, turbidity, and total suspended solids [TSS] These AoIs apply to the Segment 4a/4b POCs at Indiana Street, however, tritium has been added and uranium deleted Tritium was added as an AoI at the Indiana Street monitoring stations at the stakeholders request during the 1996 negotiations of the IMP because of prior tritium releases from the Site in the late 1960's and early 1970's

As shown below, it is proposed that at closure, plutonium, americium and uranium are the CoCs at all of the POCs, and that nitrate is also a COC for the Walnut Creek POCs

POCs	Surface Water COCs
Segment 5 at the discharge of Pond A4 and B5 (GS11 and GS08), and Segment 4b at Indiana Street (GS03)	Plutonium (239/240), Americium (241), Uranium (233/234, 235, and 238), and Nitrate
Segment 5 at the discharge of Pond C2 (GS31), and Segment 4a at Indiana Street (GS01)	Plutonium (239/240), Americium (241), and Uranium (233/234, 235, and 238)

The rationale for the COC list is as follows

- TSS, turbidity, conductivity, and pH have not been included as COCs because they are simply indicator parameters to support correlation studies of water chemistry with plutonium and americium levels These parameters may be monitored as part of the Segment 5 performance monitoring (see

1 The IMP establishes the monitoring program for Segment 5 (as well as other monitoring requirements), and implementation of the program is an ALF requirement (Section 2 5(A))

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Sectıon 5), however, ıt ıs noted that these studıes have not shown strong correlatıon at statıons where actınıde and suspended solıds concentratıons are relatıvely low

- Trıtıum has not been ıncluded as a COC because ıt has not been detected at Indıana Street over the last 5 years

- Plutonıum and amerıcıum are COCs because they may orıgınate from wıdespread contamınatıon ın surface soıl at RFETS, and by erosıon, can enter Segment 5 and 4a/4b surface water ın a dıffused manner

- Uranıum ıs a COC because ıt ıs a known contamınant of soıl and groundwater at the sıte

- Although not an AoI, nıtrate has been added as a COC for the Walnut Creek POCs because ıt ıs a contamınant of groundwater at the Solar Evaporatıon Ponds, and has been consıstently detected above the surface water standard of 10 mg/l at statıon GS-13, whıch ıs upstream of pond A-3 [concentratıons at thıs statıon are well below the Temporary Modıfıcatıon of 100 mg/l]

Other COCs are not proposed for monıtorıng at the POCs because they are not expected to adversely ımpact surface water qualıty at the POCs As dıscussed ın Sectıon 2, the COC lıst could be modıfıed ın the future ıf studıes or data ındıcate that the proposed surface water RAOs are no longer suffıcıently protectıve

4 3 Demonstratıon of Complıance

To demonstrate complıance wıth the surface water qualıty standard for radıonuclıdes, ALF currently establıshes a 30-day flow-weıghted rollıng average as the metrıc to be used for comparıng analyte concentratıons to the water qualıty standards at the POCs As dıscussed ın Sectıon 4 3 1 1, computatıon of a 12-month flow-weıghted rollıng average ıs proposed as an alternatıve metrıc for the Segment 5 POCs The methodologıes utılızed to compute these rollıng averages are descrıbed ın Appendıx 1 Because of sample holdıng tıme lımıtatıons for nıtrate, as dıscussed ın Sectıon 4 3 2, the samplıng methodology and data assessment ıs dıfferent from that used for radıonuclıdes

4 3 1 Radıonuclıdes

4 3 1 1 Segment 5 POCs

For the Segment 5 POCs, ıt ıs proposed that a 12-month flow-weıghted rollıng average concentratıon be the metrıc for comparıson to the standard As descrıbed ın Appendıx 1, the 12-month flow-weıghted average would be computed usıng flow and concentratıon data for all flow days ın a rollıng 12-month perıod The annual perıod ıs more consıstent wıth the 30+-year exposure perıod for chronıc effects from the contamınant, ı e , short duratıon fluctuatıons ın contamınant concentratıons have no ımmedıate health consequences

4 3 1 2 Segment 4a/4b POCs

For the Segment 4a/4b POCs, the more conservatıve 30-day flow-weıghted rollıng average wıll contınue to be used because of publıc acceptance of the method Unlıke the 12-month averagıng descrıbed for the Segment 5 POCs, the 30-day rollıng average would be computed usıng flow and concentratıon data for all flow days ın a rollıng 30-flow day perıod

4 3 1 3 Discussion

Because of the central importance of plutonium and americium as contaminants at RFETS, both the 30-day and 12-month rolling averages for these contaminants at the POCs are graphically displayed in Appendix 2 The earliest data used to prepare the graphs are from October 1997, when adjustments in the IMP sample collection protocol had been made to minimize collection of non-sufficient quantity (NSQ) samples

The main effect on the reported average concentrations of increasing the averaging period to 12 months is a decrease in the radionuclide concentration fluctuations, typically associated with different seasonal precipitation events The decrease in radionuclide concentration fluctuations is observed at all the surface water stations, and is due to the incorporation of the longer time series of data showing very low plutonium concentrations, consistent with an individual receptor who would ingest the water for a period of thirty years to receive a significant exposure At GS08, 12-month averages, unlike 30-flow day averages, do not approach the standard of 0 15 pCi/l However, because fluctuations are still observed, the 12-month averaging period is not so long that it would mask a significant increase in radionuclide concentrations, or more importantly, a long-term trend in the concentrations "Long-term" is emphasized because the fundamental purpose of the 12-month average is to establish a metric that is more meaningful relative to the basis for which the standard was set, i e , chronic long-term exposure to the contaminant

4 3 2 Nitrate

The IMP specifies that the holding time for samples collected for nitrate analysis is less than one week Accordingly, grab samples would be collected at the POCs for nitrate analysis Because the samples are not flow-weighted composites, a simple annual average would be computed from the data using a method consistent with the regulatory requirements for the surface water quality standard for nitrate Details of the sampling methodology and data assessment will be defined in the sampling and analysis plan for the final remedy

4 3 3 Reporting and Notification

The schedule and methods used to manage and disseminate data as well as the notification process for a non-compliance condition would be defined through mutual agreement among the RFCA parties and the interested local governments in the Proposed Plan and CAD/ROD process The CAD/ROD would also identify regulatory oversight activities and the responsibilities of DOE and the Fish and Wildlife Service after Site closure

5 0 SEGMENT 5 PERFORMANCE MONITORING

DOE recognizes that surface water quality monitoring in Segment 5 upstream of the Segment 5 POCs will be needed during the implementation of the final remedial action for the purposes of evaluating the concentration of COCs and/or other AoIs related to accelerated actions The specific analytes, as well as the monitoring locations, frequency of monitoring, and sampling methodologies will be established in the monitoring plan developed for the final remedy Details of the plan cannot be defined until all accelerated actions are completed, and surface water flow and quality data collected during the time of active remediation have been assessed pursuant to the IMP The AME and SWWB findings may also provide relevant information for the plan The Segment 5 monitoring for the final remedy will facilitate evaluation of the effectiveness of ground-water remediation systems as well as completed surface and subsurface soil accelerated actions in meeting surface water quality standards for Segment 5 Exceedances of water quality standards in Segment 5 will require an evaluation to determine the source(s) and extent of the contamination The evaluation may indicate the need for alternative or additional remedial measures to achieve compliance

6 0 REFERENCES

DOE, 2001, Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Remedial Investigation/Feasibility Study (RI/FS) Report Work Plan, Golden, Colorado, November

APPENDIX 1

COMPUTATION OF 30-DAY AND 12-MONTH

FLOW-WEIGHTED ROLLING AVERAGES

As noted in Sections 4 3 1 1 and 4 3 1 2, depending on the POC location, a 30-flow day or a 12-month flow-weighted rolling average is used to assess compliance with the COC standards This section provides the computational method for flow-weighted averaging, and describes how the method is applied to arrive at the 30-flow day and 12-month flow-weighted rolling averages using plutonium concentrations as an example

FLOW AND CONCENTRATION DATA

Flow meters and surface water samplers are located at the POCs The flow meter records the flow rate and daily volume of water discharged at the station (see Attachment 1), and provides this input to the sampler to determine the collection frequency of a composite sample of the surface water The composite sampler at the station withdraws equally sized aliquots of the surface water over time at a frequency proportional to the flow rate Depending on the flow rates, a number of days may pass before a composite sample is completed As a result, the plutonium concentration that is measured in the composite sample is assigned to every flow day over the compositing period Attachment 1 identifies the beginning of each compositing period by showing the plutonium concentration in the color red As can be seen, this plutonium concentration is assigned to the subsequent flow days over which the composite sample was collected

FLOW WEIGHTED AVERAGING

A flow-weighted average uses the volume discharged each day of the sampling period to compute the plutonium activity discharged on that day This method differs from a simple average where all plutonium concentrations would be assigned the same weight, regardless of the volume of water associated with the individual discharges With flow weighting, the plutonium concentrations on days with greater flow have greater "weight" or influence on the computed average The flow-weighted average is computed as follows

Flow-Weighted Average = $\{[Pu]_1 x V_1 + [Pu]_2 x V_2 + \quad [Pu]_n x V_n\}/\{V_1+V_2+ \quad V_n\}$

Where $[Pu]_1$ = the plutonium concentration on flow day 1

$[Pu]_n$ = *the plutonium concentration on the nth (or final) flow day of the averaging period*

V_1 = the volume of water discharged at the monitoring station on flow day 1

V_n = the volume of water discharged at the monitoring station on the nth (or final) flow day of the averaging period

As the equation indicates, the weighted average is the sum of the products of the daily plutonium concentrations and discharge volumes over the averaging period (collectively, the total activity) divided by the total amount of water discharged over the averaging period

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30-DAY FLOW-WEIGHTED ROLLING AVERAGE

When calculating the 30-day flow-weighted rolling average, the plutonium concentration and discharge volume data for the current flow day and for the previous 29 flow days are used to compute the average Days without flow in between these flow days are omitted in the computation as there is no discharge volume or corresponding plutonium activity Therefore the number of calendar days spanning the first and last flow day can be variable The computation is performed repeatedly for every new flow day that arises In each case, data for the current flow day and previous 29 flow days is included in the computation Therefore, each computed average "rolls" where data older than the last 29 flow days is ignored as data for each new flow day is added

Attachment 1 provides the flow and plutonium concentration data as well as the 30-day flow-weighted averages for GS08 for FY98 As can be seen, the first computation of a 30-day flow weighted average is not performed until 4/22/98 because nearly 6 months had to pass before there were 30 flow days on record However, for each new flow day that occurred beyond this date, a 30-day flow weighted average was calculated as described above

In terms of reporting, it is proposed that the 30-day flow weighted averages be computed and reported monthly For example, at the end of a month, a 30-day flow weighted average would be computed for every flow day in that current month, and the averages and supporting data would be provided in a monthly report

12-MONTH FLOW WEIGHTED ROLLING AVERAGE

When calculating a 12-month flow-weighted average, all flow days in a 12-month "window" are used to compute the flow-weighted average In this case, the number of flow days used in the computation will vary if the flow is intermittent within the 12-month "window" For example, at the end of a month, a 12-month flow-weighted average would be computed using data for every flow day in the current month and in the previous 11 months Therefore, each computed average for a month "rolls" where data older than the last 11 months is ignored as data for the current month is added Unlike the 30-day flow-weighted average, there is only one 12-month flow-weighted average reported per month

As shown in Attachment 2, all of the data for every flow day in FY98 were used to generate the first 12-month flow weighted average that is reported at the beginning of FY99 At the end of every month, a new "'rolling" 12-month flow weighted average was computed

Just as proposed for the 30-day average, the 12-month flow-weighted rolling averages would be computed and reported monthly

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Attachment 1 - Computation of 30 Day Average for GS08 in FY98			
red denotes start of composite sample			
Date	Daily Gallons	Pu-239,240 Rslt (pCi/l)	Pu-239,240 30d Avg (pCi/l)
10/1/97	1670352	0	
10/2/97	1260901	0	
10/3/97	107542	0	
10/4/97	128000	0	
10/5/97	123155	0	
10/6/97	130928	0	
10/7/97	139823	0	
10/8/97	148170	0	
10/9/97	171019	0	
10/10/97	97174	0	
10/11/97	0		
10/12/97	0		
1/7/98	0		
1/8/98	0		
1/9/98	0		
1/10/98	0		
1/11/98	0		
1/12/98	0		
1/13/98	0		
1/14/98	0		
1/15/98	0		
1/16/98	0		
1/17/98	0		
1/18/98	0		
1/19/98	5669	0 006	
1/20/98	0		
1/21/98	0		
3/30/98	0		
3/31/98	0		
4/1/98	0		
4/2/98	0		
4/3/98	0		
4/4/98	1189058	0 007	
4/5/98	2588557	0 007	
4/6/98	1725198	0 018	
4/7/98	1299311	0 018	
4/8/98	1461043	0 018	
4/9/98	1464348	0 018	
4/10/98	1477981	0 005	
4/11/98	1278485	0 005	
4/12/98	1131650	0 005	
4/13/98	1289098	0 005	
4/14/98	1307890	0 005	
4/15/98	1212751	0 005	
4/16/98	1244413	0 005	
4/17/98	1208601	0 005	
4/18/98	1232789	0 005	
4/19/98	1307275	0 005	

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4/20/98	2002965	0 005	
4/21/98	2339224	0 005	
4/22/98	649743	0 005	0 007
4/23/98	0		
5/14/98	0		
5/15/98	0		
5/16/98	0		
5/17/98	0		
5/18/98	0		
5/19/98	0		
5/20/98	0		
5/21/98	0		
5/22/98	1965933	0 006	0 007
5/23/98	1854408	0 006	0 008
5/24/98	1964762	0 006	0 008
5/25/98	1903914	0	0 007
5/26/98	1813460	0	0 007
5/27/98	1290137	0	0 007
5/28/98	1159950	0 023	0 007
5/29/98	1189361	0 023	0 008
5/30/98	1135138	0 023	0 008
5/31/98	1103274	0 023	0 009
6/1/98	903099	0 023	0 009
6/2/98	970079	0 006	0 009
6/3/98	1109536	0 006	0 009
6/4/98	987273	0 006	0 008
6/5/98	1046970	0 006	0 008
6/6/98	927087	0 006	0 008
6/7/98	446430	0 006	0 007
6/8/98	120732	0 006	0 007
6/12/98	0		
6/13/98	0		
6/14/98	0		
6/15/98	0		

Attachment 2 - Computation of 365 Day Average for GS08 in FY 99			
red denotes start of composite sample			
Date	Daily Gallons	Pu-239,240 Rslt (pCi/l)	Pu-239,240 365cald Avg (pCi/l)
10/1/97	1670352	0	
10/2/97	1260901	0	
10/3/97	107542	0	
10/4/97	128000	0	
10/5/97	123155	0	
10/6/97	130928	0	
10/7/97	139823	0	
10/8/97	148170	0	
10/9/97	171019	0	
10/10/97	97174	0	
10/11/97	0		
10/12/97	0		
1/11/98	0		
1/12/98	0		
1/13/98	0		
1/14/98	0		
1/15/98	0		
1/16/98	0		
1/17/98	0		
1/18/98	0		
1/19/98	5669	0 006	
1/20/98	0		
1/21/98	0		
3/30/98	0		
3/31/98	0		
4/1/98	0		
4/2/98	0		
4/3/98	0		
4/4/98	1189058	0 007	
4/5/98	2588557	0 007	
4/6/98	1725198	0 018	
4/7/98	1299311	0 018	
4/8/98	1461043	0 018	
4/9/98	1464348	0 018	
4/10/98	1477981	0 005	
4/11/98	1278485	0 005	
4/12/98	1131650	0 005	
4/13/98	1289098	0 005	
4/14/98	1307890	0 005	
4/15/98	1212751	0 005	
4/16/98	1244413	0 005	
4/17/98	1208601	0 005	
4/18/98	1232789	0 005	
4/19/98	1307275	0 005	
4/20/98	2002965	0 005	
4/21/98	2339224	0 005	
4/22/98	649743	0 005	
4/23/98	0		

5/14/98	0		
5/15/98	0		
5/16/98	0		
5/17/98	0		
5/18/98	0		
5/19/98	0		
5/20/98	0		
5/21/98	0		
5/22/98	1965933	0 006	
5/23/98	1854408	0 006	
5/24/98	1964762	0 006	
5/25/98	1903914	0	
5/26/98	1813460	0	
5/27/98	1290137	0	
5/28/98	1159950	0 023	
5/29/98	1189361	0 023	
5/30/98	1135138	0 023	
5/31/98	1103274	0 023	
6/1/98	903099	0 023	
6/2/98	970079	0 006	
6/3/98	1109536	0 006	
6/4/98	987273	0 006	
6/5/98	1046970	0 006	
6/6/98	927087	0 006	
6/7/98	446430	0 006	
6/8/98	120732	0 006	
6/12/98	0		
6/13/98	0		
6/14/98	0		
6/15/98	0		
9/27/98	0		
9/28/98	0		
9/29/98	0		
9/30/98	0		0 008
10/1/98	0		
10/2/98	0		
10/24/98	0		
10/25/98	0		
10/26/98	0		
10/27/98	0		
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10/29/98	0		
10/30/98	0		
10/31/98	0		0 008
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11/2/98	0		
11/24/98	0		
11/25/98	0		
11/26/98	0		
11/27/98	0		
11/28/98	0		
11/29/98	0		

11/30/98	0		0 008
12/1/98	0		
12/2/98	0		
12/24/98	0		
12/25/98	0		
12/26/98	0		
12/27/98	0		
12/28/98	0		
12/29/98	0		
12/30/98	0		
12/31/98	0		0 008
1/1/99	0		
1/2/99	0		
1/24/99	0		
1/25/99	0		
1/26/99	0		
1/27/99	0		
1/28/99	0		
1/29/99	0		
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1/31/99	0		0 008
2/1/99	0		
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2/26/99	0		
2/27/99	0		
2/28/99	0		0 008
3/1/99	0		
3/2/99	0		
3/20/99	0		
3/21/99	0		
3/22/99	717343	0 007	
3/23/99	1479265	0 007	
3/24/99	1510687	0 007	
3/25/99	1291862	0 012	
3/26/99	1271975	0 012	
3/27/99	1335488	0 012	
3/28/99	1369649	0 012	
3/29/99	915023	0 005	
3/30/99	698907	0 005	
3/31/99	680054	0 005	0 008
4/1/99	842893	0 005	
4/2/99	964159	0 005	
4/3/99	631839	0 005	
4/4/99	451256	0 005	
4/5/99	153735	0 005	
4/6/99	0		
4/7/99	0		
4/24/99	0		
4/25/99	0		
4/26/99	1116552	0 01	

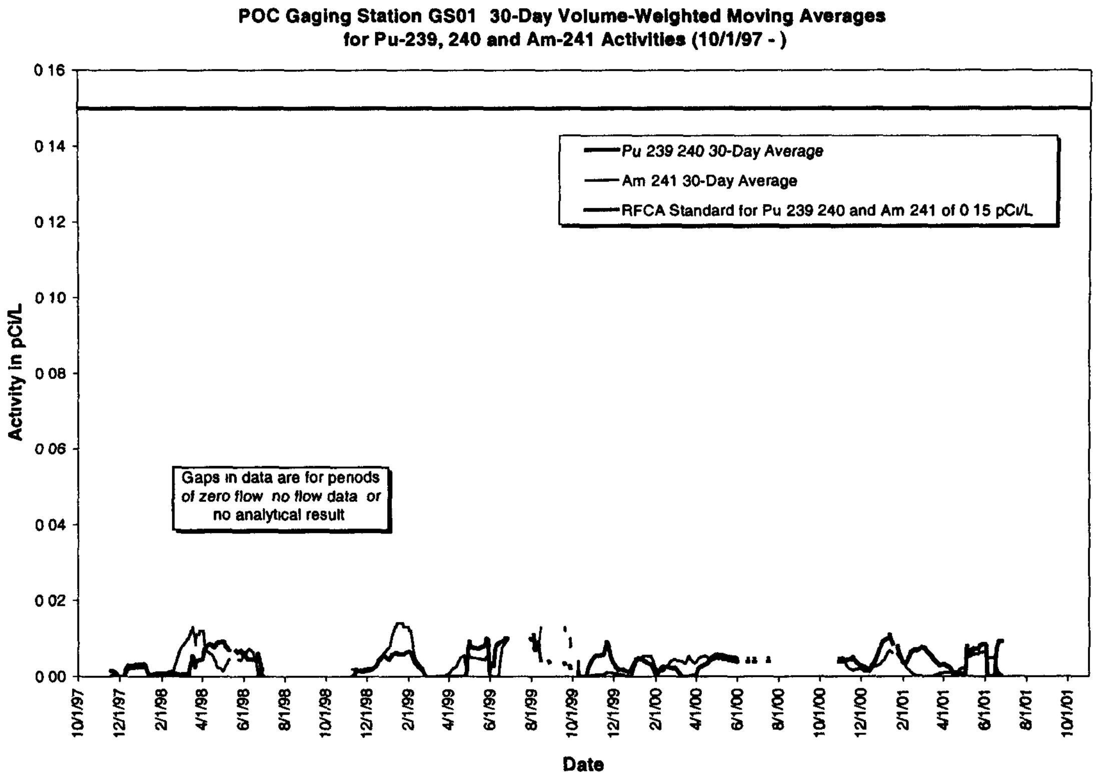
19

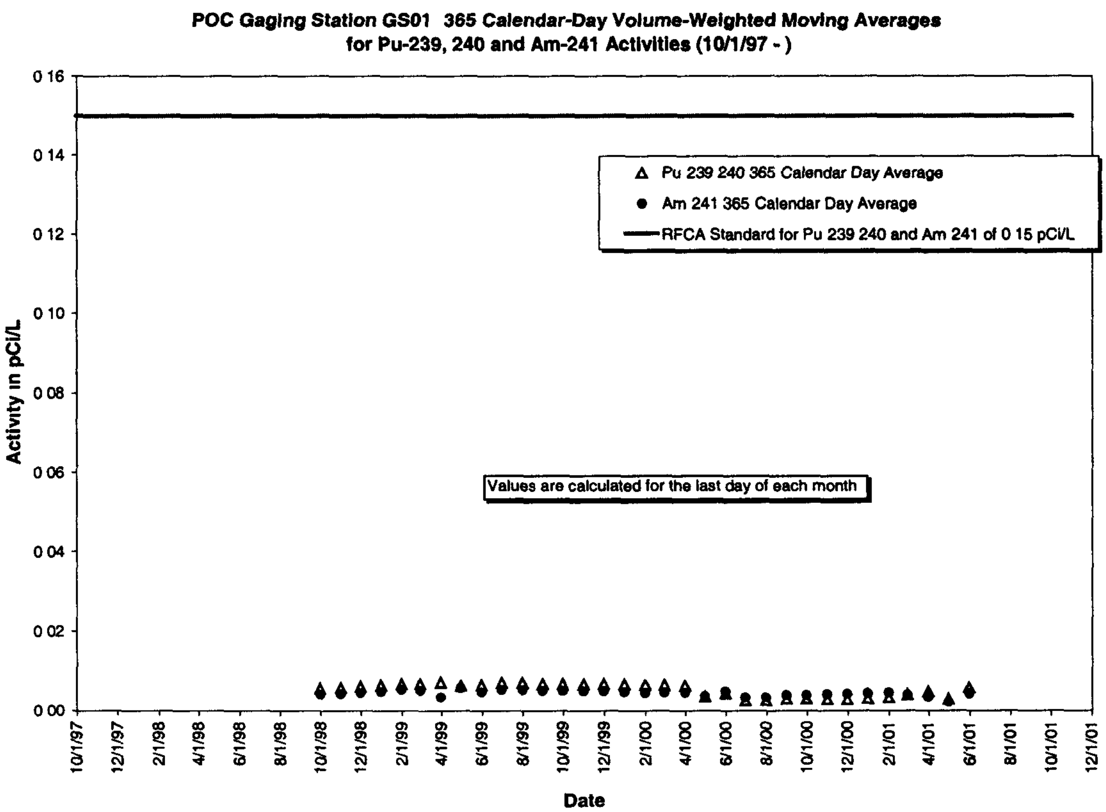
4/27/99	1909227	0 01	
4/28/99	1489419	0 01	
4/29/99	1507019	0 04	
4/30/99	1750903	0 04	0 011
5/1/99	2039234	0 04	
5/2/99	2035564	0 004	
5/3/99	2002625	0 004	
5/4/99	1584916	0 004	
5/5/99	1381010	0 004	
5/6/99	1387969	0 011	
5/7/99	1385737	0 011	
5/8/99	1321435	0 011	
5/9/99	884425	0 011	
5/10/99	918313	0 011	
5/11/99	1059714	0 004	
5/12/99	1018058	0 004	
5/13/99	1086406	0 004	
5/14/99	1228569	0 004	
5/15/99	1070226	0 004	
5/16/99	690251	0 004	
5/17/99	1228794	0 004	
5/18/99	907386	0 004	
5/19/99	0		
5/20/99	0		
5/21/99	0		
5/22/99	0		
5/23/99	0		
5/24/99	0		
5/25/99	0		
5/26/99	0		
5/27/99	0		
5/28/99	0		
5/29/99	0		
5/30/99	0		
5/31/99	0		0 011
6/1/99	0		
6/2/99	0		
6/16/99	0		
6/17/99	0		
6/18/99	1091533	0 009	
6/19/99	1839351	0 009	
6/20/99	1681610	0 009	
6/21/99	1383000	0 009	
6/22/99	1286381	0 009	
6/23/99	1194520	0 603	
6/24/99	1042252	0 603	
6/25/99	875269	0 603	
6/26/99	721244	0 603	
6/27/99	639120	0 603	
6/28/99	1196382	0 603	
6/29/99	1355767	0 603	
6/30/99	313884	0 603	0 083

7/1/99	0		
7/2/99	0		
7/24/99	0		
7/25/99	0		
7/26/99	0		
7/27/99	0		
7/28/99	0		
7/29/99	0		
7/30/99	0		
7/31/99	0		0 083
8/1/99	0		
8/2/99	0		
8/3/99	0		
8/4/99	0		
8/5/99	857647	0 011	
8/6/99	1903826	0 011	
8/7/99	1884792	0 011	
8/8/99	1872367	0 007	
8/9/99	1495404	0 007	
8/10/99	1322694	0 007	
8/11/99	1341428	0 007	
8/12/99	1340930	0 007	
8/13/99	1244867	0 022	
8/14/99	1070994	0 022	
8/15/99	808027	0 022	
8/16/99	1000731	0 022	
8/17/99	949087	0 022	
8/18/99	878886	0 022	
8/19/99	351582	0 022	
8/20/99	0		
8/21/99	0		
8/22/99	0		
8/23/99	0		
8/24/99	0		
8/25/99	0		
8/26/99	0		
8/27/99	0		
8/28/99	0		
8/29/99	0		
8/30/99	0		
8/31/99	0		0 067
9/1/99	0		
9/2/99	0		
9/24/99	0		
9/25/99	0		
9/26/99	0		
9/27/99	0		
9/28/99	0		
9/29/99	0		
9/30/99	0		0 067

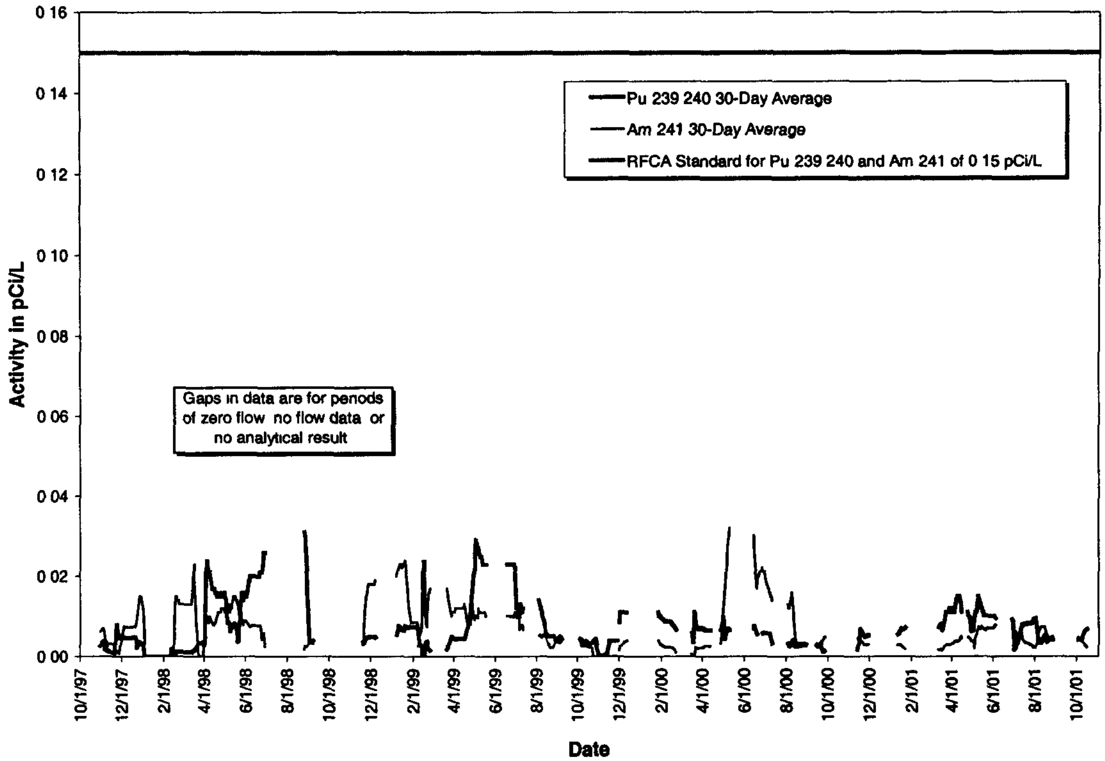
APPENDIX 2

30-DAY AND 12-MONTH FLOW WEIGHTED ROLLING AVERAGE CONCENTRATIONS FOR PLUTONIUM AND AMERICIUM AT POINTS OF COMPLIANCE

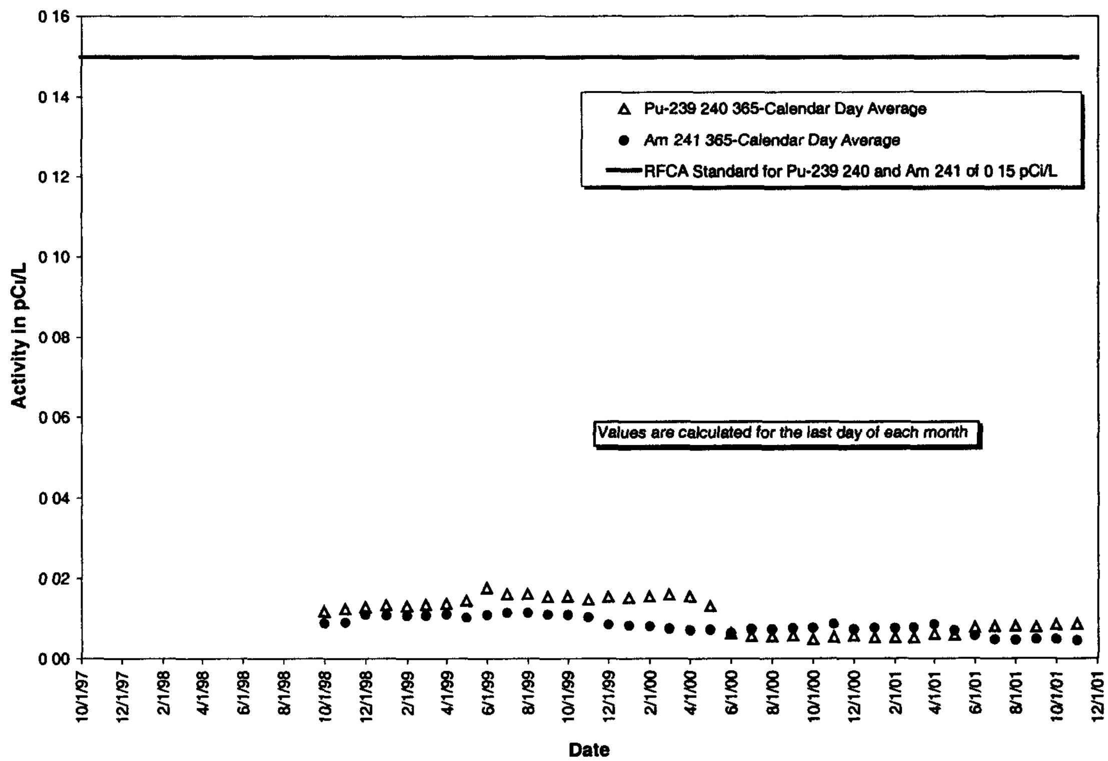

POC Gaging Station GS01 30-Day Volume-Weighted Moving Averages
for Pu-239, 240 and Am-241 Activities (10/1/97 -)
Pu 239 240 30-Day Average
Am 241 30-Day Average
RFCA Standard for Pu 239 240 and Am 241 of 0 15 pCi/L
Gaps in data are for periods of zero flow no flow data or no analytical result
Activity in pCi/L
Date


POC Gaging Station GS01 365 Calendar-Day Volume-Weighted Moving Averages
for Pu-239, 240 and Am-241 Activities (10/1/97 -)
Pu 239 240 365 Calendar Day Average
Am 241 365 Calendar Day Average
RFCA Standard for Pu 239 240 and Am 241 of 0 15 pCi/L
Values are calculated for the last day of each month
Activity in pCi/L
Date

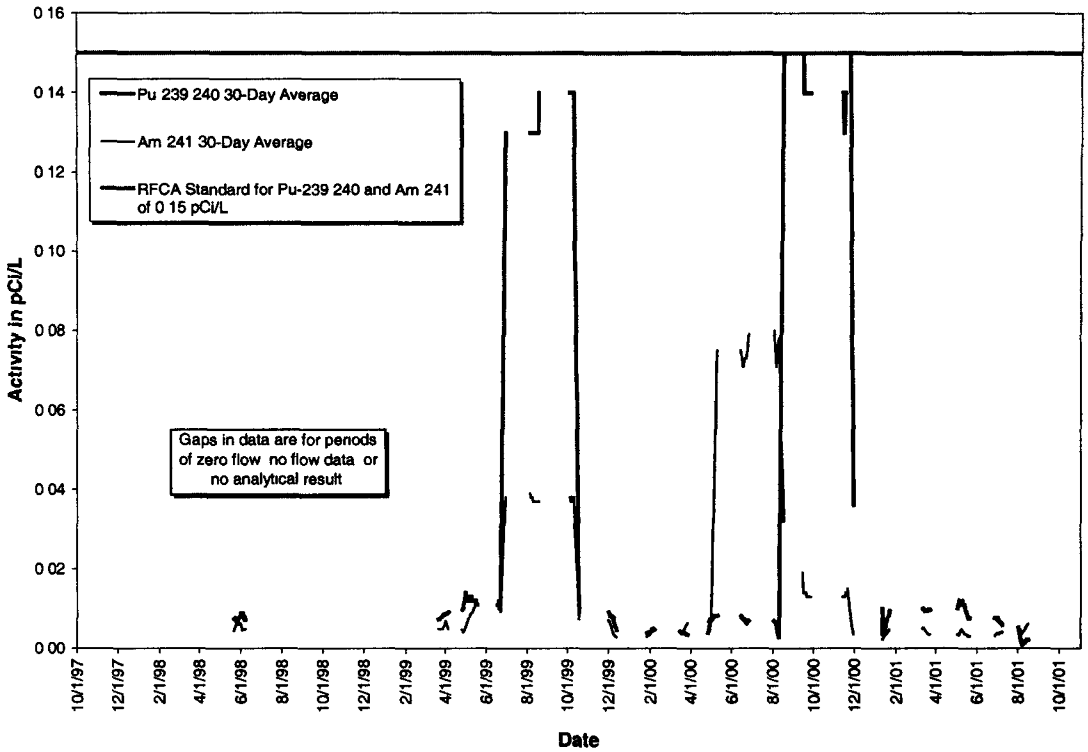
POC Gaging Station GS03 30-Day Volume-Weighted Moving Averages for Pu-239, 240 and Am-241 Activities (10/1/97 -)



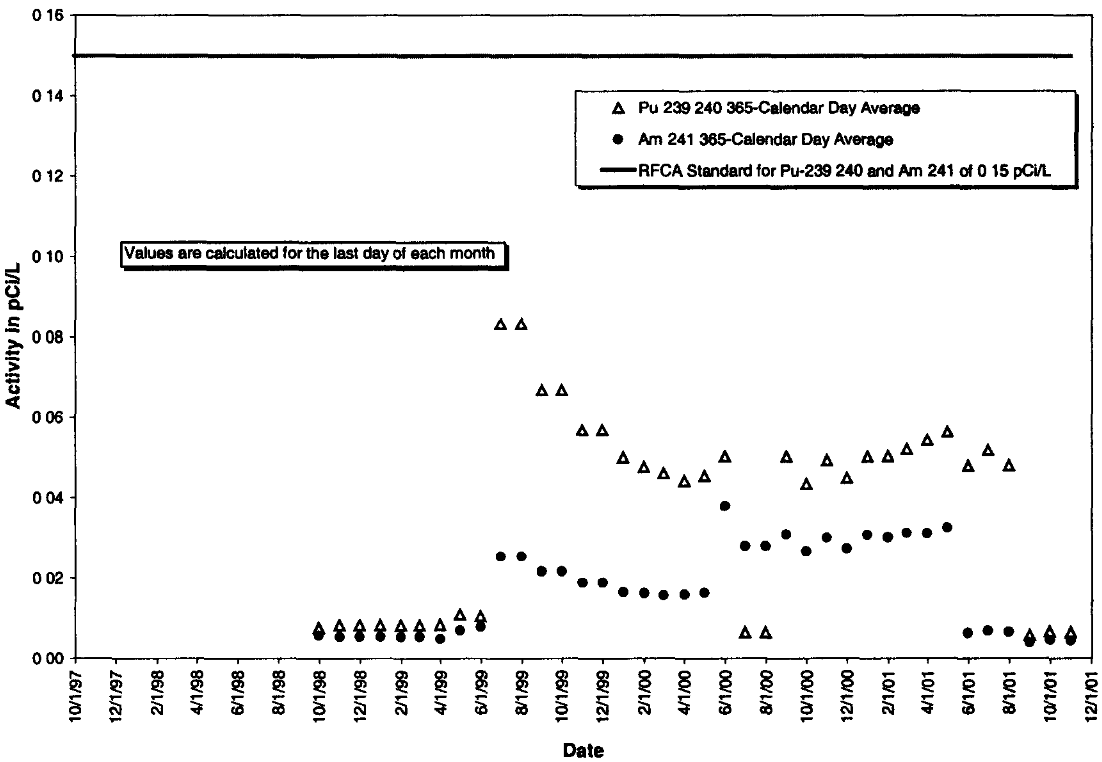
POC Gaging Station GS03 365-Calendar Day Volume-Weighted Moving Averages for Pu-239, 240 and Am-241 Activities (10/1/97 -)



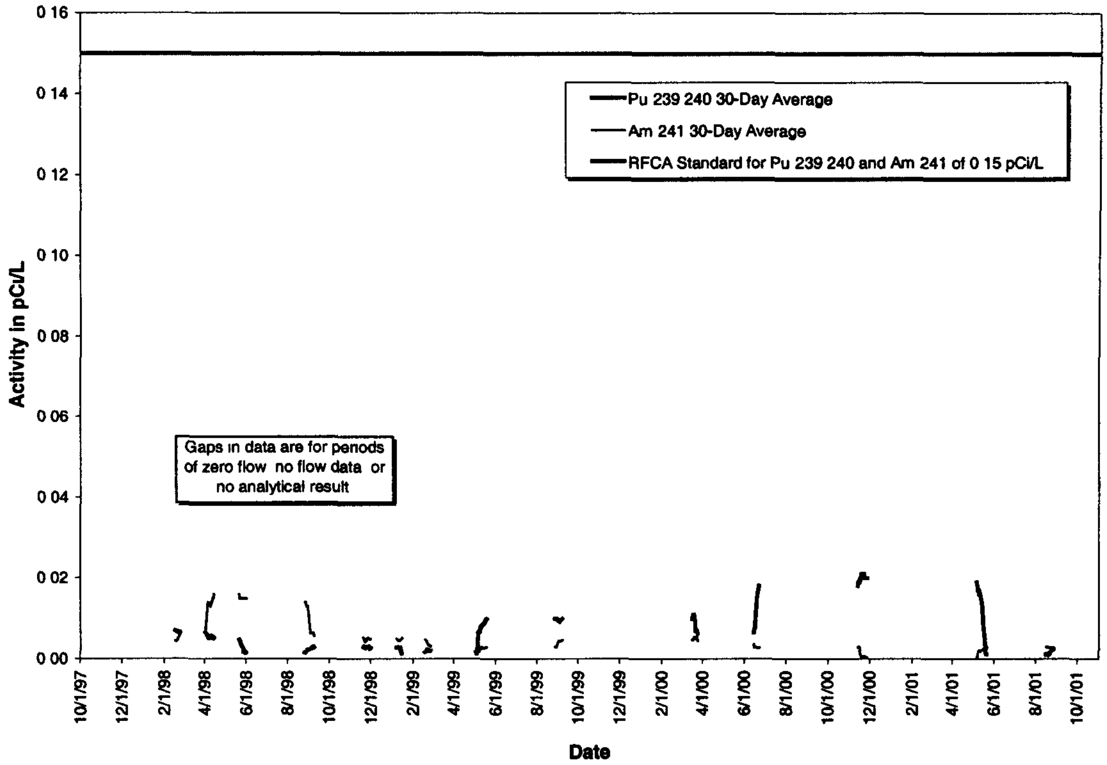
POC Gaging Station GS08 30-Day Volume-Weighted Moving Averages for Pu-239, 240 and Am-241 Activities (10/1/97 -)



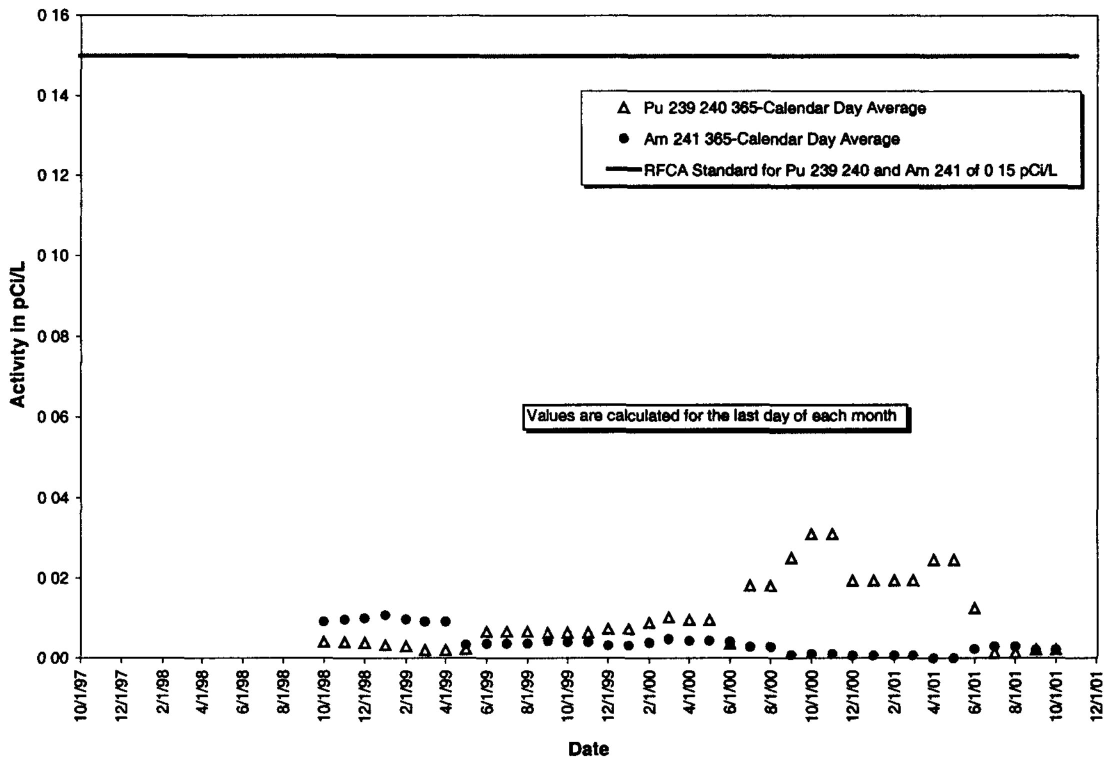
POC Gaging Station GS08 365-Calendar Day Volume-Weighted Moving Averages for Pu-239, 240 and Am-241 Activities (10/1/97 -)

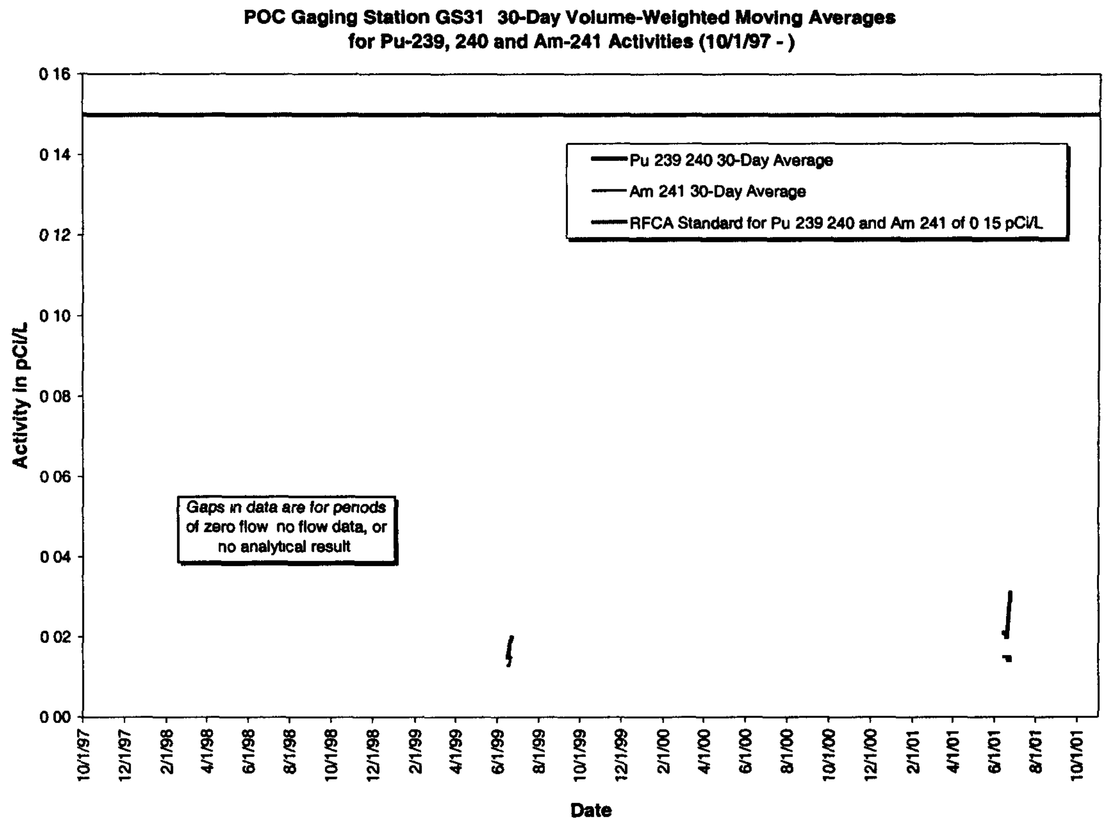


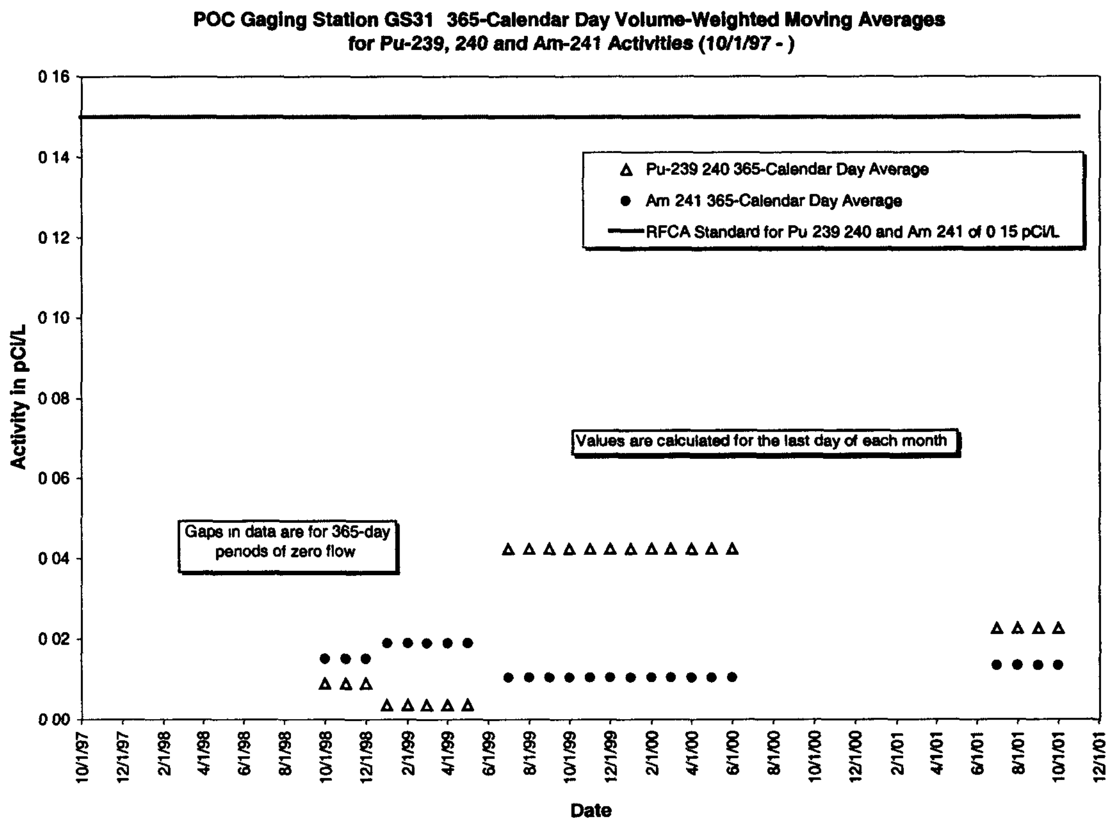
POC Gaging Station GS11 30-Day Volume-Weighted Moving Averages for Pu-239, 240 and Am-241 Activities (10/1/97 -)



POC Gaging Station GS11 365-Calendar Day Volume-Weighted Moving Averages for Pu-239, 240 and Am-241 Activities (10/1/97 -)




POC Gaging Station GS31 30-Day Volume-Weighted Moving Averages
for Pu-239, 240 and Am-241 Activities (10/1/97 -)
Pu 239 240 30-Day Average
Am 241 30-Day Average
RFCA Standard for Pu 239 240 and Am 241 of 0 15 pCi/L
Gaps in data are for periods of zero flow no flow data, or no analytical result
Activity in pCi/L
0 16
0 14
0 12
0 10
0 08
0 06
0 04
0 02
0 00
10/1/97
12/1/97
2/1/98
4/1/98
6/1/98
8/1/98
10/1/98
12/1/98
2/1/99
4/1/99
6/1/99
8/1/99
10/1/99
12/1/99
2/1/00
4/1/00
6/1/00
8/1/00
10/1/00
12/1/00
2/1/01
4/1/01
6/1/01
8/1/01
10/1/01
Date


POC Gaging Station GS31 365-Calendar Day Volume-Weighted Moving Averages
for Pu-239, 240 and Am-241 Activities (10/1/97 -)
Pu-239 240 365-Calendar Day Average
Am 241 365-Calendar Day Average
RFCA Standard for Pu 239 240 and Am 241 of 0 15 pCi/L
Values are calculated for the last day of each month
Gaps in data are for 365-day periods of zero flow
Activity in pCi/L
0 16
0 14
0 12
0 10
0 08
0 06
0 04
0 02
0 00
10/1/97
12/1/97
2/1/98
4/1/98
6/1/98
8/1/98
10/1/98
12/1/98
2/1/99
4/1/99
6/1/99
8/1/99
10/1/99
12/1/99
2/1/00
4/1/00
6/1/00
8/1/00
10/1/00
12/1/00
2/1/01
4/1/01
6/1/01
8/1/01
10/1/01
12/1/01
Date